

NOTICE: If the film image
is less clear than this
notice, it is due to the
quality of the document
being filmed

17

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING
PROGRAM DESIGN
TASK VI
FINAL REPORT

PREPARED FOR
NEW YORK STATE DEPARTMENT OF
ENVIRONMENTAL CONSERVATION


BY
E.C. JORDAN COMPANY

A PUBLIC PRESENTATION
NIAGARA FALLS, N. Y.
AUGUST 6, 1985

LOV 002

0004

F

252775


NOTICE: If the film image
is less clear than this
notice, it is due to the
quality of the document
being filmed

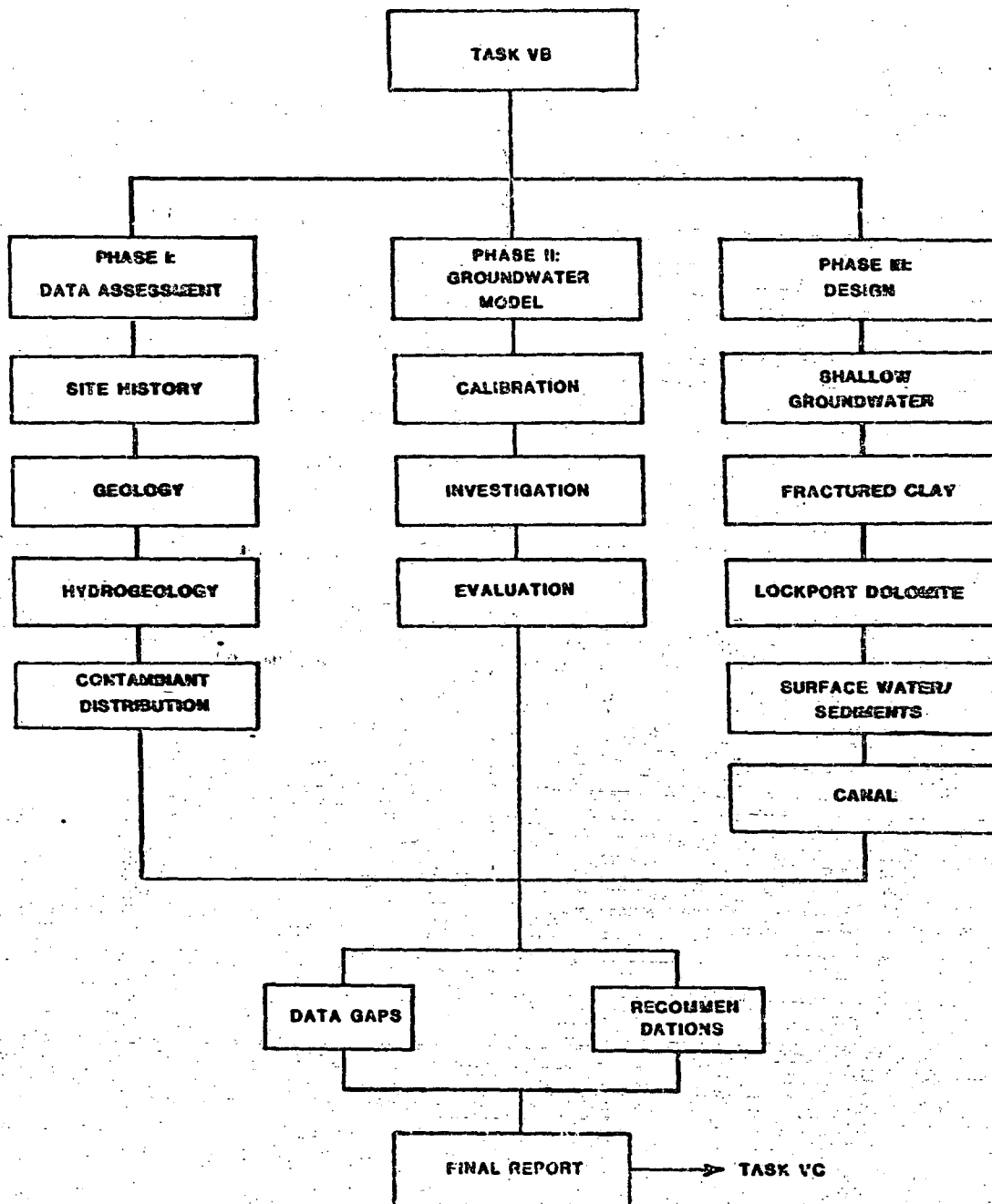
PROJECT OBJECTIVES

1. ESTABLISH MONITORING STATIONS WHICH WOULD PROVIDE EARLY WARNING OF FUTURE SIGNIFICANT MIGRATION FROM THE CANAL.
2. PROVIDE INFORMATION ON THE EFFECTS AND EFFECTIVENESS OF REMEDIAL ACTIONS ALREADY IMPLEMENTED AT THE CANAL.
3. PROVIDE DATA WHICH WILL FORM PART OF THE BASIS FOR HABITABILITY DECISIONS FOR HOMES WITHIN THE DECLARATION AREA AND REASSESSMENTS OF THAT DECISION.

LOV 002

0015

PROJECT TASK ELEMENTS



NOTICE: If the film image is less clear than this notice, it is due to the quality of the document being filmed

LOV 002

00115

PHASE I HIGHLIGHTS

GEOLOGY

THE SITE OVERBURDEN CONSISTS GENERALLY OF SUCCESSIVE LAYERS OF FILL AND SANDY SILTS, CLAY AND A GLACIAL TILL MATERIAL. THESE UNCONSOLIDATED MATERIALS OVERLIE A THICK ZONE OF DOLOMITE (LIMESTONE). THE UPPER ZONES OF THE CLAY AND DOLOMITE EXHIBIT FRACTURING. SAND LENSES ARE PRESENT WITHIN THE LESS PERMEABLE MATERIALS BUT ARE PROBABLY DISCONTINUOUS. THE SETTING IS TYPICAL OF GLACIO-LACUSTRINE ENVIRONMENTS.

HYDROGEOLOGY

GROUNDWATER MOVES MOST FREELY THROUGH THE MORE PERMEABLE ZONES OF THE SANDS AND FILLS AND THE FRACTURED DOLOMITE. THE UPPER AQUIFER IN THE FILLS AND SANDY SILTS IS A WATER TABLE AQUIFER SUBJECT TO CHANGES IN LEVEL DUE TO PRECIPITATION PERCOLATING INTO THE GROUND. THE LOWER DOLOMITE AQUIFER IS CONFINED ABOVE AND BELOW BY LESS PERMEABLE MATERIALS. THE PIEZOMETRIC LEVELS (PRESSURES) IN THE DOLOMITE AQUIFER APPEAR TO BE STRONGLY INFLUENCED BY THE HEIGHT (STAGE) OF THE NIAGARA RIVER. SHALLOW FLOWS IN THE VICINITY OF THE CANAL ARE STRONGLY INFLUENCED BY THE ACTIONS OF THE CAP AND THE BARRIER DRAIN. THE FLOW IN THE DOLOMITE AQUIFER IS GENERALLY SOUTHWEST TOWARD THE NIAGARA RIVER. VERTICAL SEEPAGE FLOWS MAY BE IMPORTANT RELATIVE TO LATERAL FLOWS IN THE SHALLOW AQUIFER, BUT VERTICAL FLOWS WILL ALSO BE INFLUENCED BY THE ACTION OF THE DRAIN, THE CAP AND THE HEIGHT OF THE NIAGARA RIVER. THE SWALES AND SAND LENSES MAY HAVE BEEN ACTIVE PATHWAYS FOR CONTAMINANT MIGRATION IN THE PAST.

LOW 002

00117

NOTICE: If the film image
is less clear than this
notice, it is due to the
quality of the document
being filmed

CONTAMINANT DISTRIBUTION

CONTINUING ANALYSES OF THE LEACHATE COLLECTED
IN THE BARRIER DRAIN SHOW THE PRESENCE OF
VOLATILE AND SEMIVOLATILE ORGANIC COMPOUNDS.
ANALYSES OF SAMPLES OF GROUNDWATER FROM
MONITORING WELLS SHOW ONLY LIMITED
MIGRATION OF CONTAMINANTS TO THE EAST AND
WEST. INVESTIGATIONS IN SOILS AROUND THE
PERIMETER OF THE CANAL (TASK VA) INDICATED
SOME NEARBY AREAS TO THE NORTH AND SOUTH
WHERE CONTAMINATION HAS MOVED BEYOND COLVIN
BOULEVARD AND FRONTIER AVENUE. BACKFILL
MATERIAL IN SEWER LINE TRENCHES ALONG
WHEATFIELD AND FRONTIER MAY HAVE PROVIDED
PREFERENTIAL PATHWAYS FOR CONTAMINANT
MIGRATION.

LOV 002

001113

PHASE II HIGHLIGHTS

GROUNDWATER MODEL

A GROUNDWATER FLOW MODEL WAS USED TO GAIN A BETTER UNDERSTANDING OF SITE HYDROGEOLOGY AND TO USE AS A TOOL IN MONITORING PROGRAM DESIGN. THE MODEL WILL BE REFINED IN THE FUTURE WITH ADDITIONAL DATA TO INCREASE THE CONFIDENCE IN ITS PREDICTIVE CAPABILITIES.

MODEL CALIBRATION

THE MODEL WAS CALIBRATED (INPUT FACTORS ADJUSTED) SO THAT THE MODEL COMPUTATIONS AGREED WITHIN ACCEPTABLE LIMITS TO KNOWN CONDITIONS OF GROUNDWATER POTENTIALS AND FLOW.

INVESTIGATION

VARIOUS FACTORS, SUCH AS HYDRAULIC CONDUCTIVITIES AND RECHARGE RATES, WERE VARIED TO EXPLORE THE SENSITIVITY OF THE GROUNDWATER FLOWS TO CHANGES IN THESE FACTORS AND TO INDICATE THEIR PROBABLE LIMITS OF INFLUENCE.

EVALUATION

THE EFFECTS OF THE CAP, THE EXTENDED CAP AND THE BARRIER DRAIN SYSTEM WERE SIMULATED. THE MAXIMUM DISTANCE AT WHICH THE DRAIN WOULD STILL HAVE INFLUENCE WAS ESTIMATED AS WELL AS LEVELS TO WHICH GROUNDWATER WOULD FALL AS TIME PASSES. THESE OBSERVATIONS WERE UTILIZED IN THE PROGRAM DESIGN.

MODELING INDICATED A NEED FOR MORE HYDROGEOLOGIC DATA AND MONITORING IN THE VICINITY OF THE CANAL. IT ALSO SUGGESTED THAT ATYPICAL MIGRATION WOULD NOT BE ANTICIPATED AND THAT THE BEST ASSURANCE FOR NO FURTHER SIGNIFICANT LATERAL MIGRATION OF WASTES IN GROUNDWATER IN SHALLOW SOILS WOULD LIE IN THE ESTABLISHMENT AND MAINTENANCE OF HYDRAULIC GRADIENTS DIRECTED INWARDLY TOWARD THE BARRIER DRAIN SYSTEM.

LOV 002

07/19

PHASE III HIGHLIGHTS

SHALLOW GROUNDWATER

GROUNDWATER MOVEMENT THROUGH THE SANDY SILTS AND MORE PERMEABLE FILLS MAY HAVE BEEN PROBABLE ROUTES OF GROUNDWATER CONTAMINANT MIGRATION. IT WILL BE IMPORTANT TO ESTABLISH MIGRATION EXTENTS AND DEMONSTRATE INWARD GRADIENTS WHICH MINIMIZE THE POTENTIAL FOR MIGRATION.

LOCKPORT DOLOMITE

IF CONTAMINATION SEEPS THROUGH THE CLAYS AND TILLS UNDERLYING THE WASTES, IT WILL PASS INTO THE AQUIFER IN THE MORE PERMEABLE (FRACTURED) ZONE OF THE LOCKPORT DOLOMITE. WELLS DOWNGRADIENT OF THE FLOW IN THIS AQUIFER AND PIEZOMETERS IN THE CANAL WASTES WILL BE USED TO ASSESS POTENTIALS FOR OR ACTUAL INDICATIONS OF ESCAPING WASTES.

FRACTURED CLAY

FRACTURES IN THE DESICCATED CLAY OFFER A POTENTIAL FOR CONTAMINANT MIGRATION. SPECIAL WELL INSTALLATIONS HAVE BEEN DESIGNED TO INCREASE DETECTION CAPABILITIES SHOULD FURTHER FIELD INVESTIGATION YIELD DATA INDICATING FAVORABLE OPERATION OF THESE INSTALLATIONS.

SURFACE WATER/SEDIMENTS

STUDIES HAVE SHOWN THE PRESENCE OF LOVE CANAL RELATED CONTAMINANTS IN SEDIMENTS OF THE BLACK, BURGHOLTZ AND CAYUGA CREEKS. AREAS OF THE CREEKS HAVE BEEN INDICATED FOR FURTHER STUDY AND CLEAN-UP. AT THIS TIME THE MONITORING PROGRAM FOR SURFACE WATER AND SEDIMENTS SEEKS ONLY TO ESTABLISH A DATUM IN A FEW LOCATIONS AT THIS TIME PENDING THE ACCOMPLISHMENT OF THESE OTHER ACTIVITIES.

LOV 002

000000

NOTICE: If the film image
is less clear than this
notice, it is due to the
quality of the document
being filmed

CANAL

THE CANAL WAS REPORTEDLY SEPARATED INTO CELLS BEFORE WASTES WERE PLACED. EACH CELL MAY BEHAVE DIFFERENTLY DEPENDING ON THE WASTE TYPES AND CONDITION OF THE UNDERLYING SOILS. WHILE TYPICAL GROUNDWATER CONTAMINATION WITHIN THE CANAL CAN BE ASSESSED WITH ANALYSES OF SAMPLES FROM THE BARRIER DRAIN SYSTEM, THE HYDRAULIC RESPONSE OF EACH CELL CAN BE DETERMINED BEST BY THE PLACEMENT OF PIEZOMETERS IN EACH CELL.

THE MONITORING PROGRAM HAS BEEN DESIGNED BASED ON THE BEST AVAILABLE DATA AND SPECIAL CONSIDERATIONS GIVEN TO PROBABLE PATHWAYS OF MIGRATION. THE PROGRAM SPECIFIES FREQUENCIES OF ANALYSIS BASED ON POTENTIAL RATES OF MIGRATION OR MINIMUM REASONABLE INTERVALS, WHICHEVER IS LESS. THE PROGRAM IS INTENDED TO BE FLEXIBLE WITH FREQUENT ASSESSMENTS OF DATA WHICH MAY CALL FOR ALTERNATE MONITORING STATIONS AND/OR SCHEDULES. PARAMETERS SELECTED FOR ANALYSIS INCLUDE PRIORITY POLLUTANTS OR KEY INDICATORS WHICH HAVE TYPIFIED THE CONTAMINANTS FOUND IN SOILS AND GROUNDWATER AT THE CANAL.

LOW 002

0021

NOTICE: If the film image
is less clear than this
notice, it is due to the
quality of the document
being filmed

DATA GAPS

THE PROJECT INDICATED THE FOLLOWING AREAS WHERE
ADDITIONAL INFORMATION IS NEEDED OR WOULD BE
HIGHLY USEFUL.

- * HYDROGEOLOGIC DATA SUCH AS HYDRAULIC
CONDUCTIVITIES AT MORE LOCATIONS
- * MORE ANALYSES IN THE SHALLOW FILLS AND
SANDY SILTS
- * MORE INVESTIGATION OF FRACTURED ZONES
- * A BROADER BASE OF WATER LEVEL DATA
- * DEFINITION OF THE LIMITS OF CONTAMINANT
MIGRATION
- * PERIODIC RECORDING OF THE WATER SURFACE
ELEVATION IN THE NIAGARA RIVER
- * FURTHER INVESTIGATION OF THE HYDRAULIC
CONNECTION BETWEEN THE FRACTURED
DOLOMITE AND THE NIAGARA RIVER

LOV 002

000000

NOTICE: If the film image
is less clear than this
notice, it is due to the
quality of the document
being filmed

CONCLUSIONS

THE MONITORING PROGRAM HAS BEEN DESIGNED BASED ON AVAILABLE INFORMATION TO SATISFY THE GOALS OF THE PROJECT AS STATED EARLIER. WHILE THE DATA GENERATED BY THE MONITORING PROGRAM IS AN IMPORTANT FACTOR IN ADDRESSING CONTINUED ENVIRONMENTAL SAFETY, IT IS ONLY ONE FACTOR IN THE OVERALL ASSESSMENT. THE MONITORING PROGRAM IS SCHEDULED FOR IMPLEMENTATION TO BEGIN THIS MONTH WITH FIELD WORK LIKELY TO BEGIN IN SEPTEMBER.

THE MONITORING PROGRAM, IN CONNECTION WITH THE COMPLETION OF A PERIMETER SURVEY, HAS BEEN DESIGNED NOT ONLY TO PROVIDE DATA ON CONTAMINANT DISTRIBUTIONS, BUT ALSO TO SUPPLY DATA TO ADDRESS EACH OF THE DATA GAPS REFERRED TO PREVIOUSLY.

LOV 002

000000

L